PROACT
SUCCESS STORY
of Compliance and Pollution Prevention
An Environmental Resource sponsored by HQ Air Force Center for Environmental Excellence

Ellsworth AFB

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Ellsworth Air Force Base (AFB) is located in Western South Dakota, approximately 6 miles east of Rapid City in both Meade and Pennington counties. The main base consists of 4,858 acres comprised of runways, airfield operations, industrial areas, housing and recreational facilities. Ellsworth AFB was officially activated in July 1942 as the Rapid City Army Air Base, a training facility for B-17 bomber crews.

After World War II the base briefly trained weather reconnaissance and combat squadrons. However, those missions soon ended and Rapid City Army Air Field temporarily shut down from September 1946 through March 1947. When operations resumed in 1947, the base was a new United States Air Force asset. The primary unit assigned to Rapid City Air Force Base was the new 28th Bombardment Wing (BMW).

In 1962, the 44th Strategic Missile Wing was assigned to Ellsworth AFB and soon operated nine Titan I intercontinental ballistic missiles (ICBMs). In 1963, 150 Minuteman ICBM silos were declared combat ready and remained on alert until the early 1990's when they were deactivated. The 44th Missile Wing was inactivated in 1994.

On 1 June 1992, as part of the first major USAF reorganization, the Air Force inactivated Strategic Air Command and assigned most of Ellsworth AFB's organizations, including a renamed 28th Bomb Wing (BW) to the newly activated Air Combat Command (ACC). After less than a year under the new command, the 28th's mission changed from that of strategic bombardment to one of worldwide conventional munitions delivery.

The 28th Bomb Wing (which includes the 34th and 37th Bomb Squadrons) is the current host unit. The 28th is the Air Force's lead conventional B1-B bomber wing. Tenant units include Detachment 2 and 5 of the 57 WG, the Test Division and the B1-B Weapons School. The 28th's vision is to be the "backbone" of global engagement for the 21st century, and its mission is to provide rapid, decisive, and sustainable combat airpower; anytime, anywhere.

Environmental Successes

Industrial Process Modification/ Improvements

Petroleum Product Recovery System

Water condensation in fuel tanks contributed to approximately half of the hazardous waste generated on Ellsworth AFB. Condensed water absorbs benzene from fuel, making the condensate a hazardous waste. This condensation (found at the bottom of the fuel tanks) is referred to as water bottoms. The amount of condensate generated is directly related to changes in temperature and humidity. Ellsworth AFB generated 33,796 pounds of condensate in 1996 at a disposal cost of $106,457. Consequently, a water filtration system was designed and implemented to remove the benzene from the water; thereby, reducing hazardous waste generated by 50% and saving approximately $100,000 per year in hazardous waste disposal.

The condensate is characterized as a hazardous waste, having benzene concentrations greater than 0.5 mg/L, although concentrations generally range from 0.4 to 2.9 mg/L. The condensate is managed as a hazardous waste from the time the water is removed from the fuel tanks until it enters the water filtration system. Once the condensate enters the filtration system, the discharge is managed under the Clean Water Act (CWA).

The condensate is collected in 55-gallon drums, which are placed horizontally on a drum lift, allowing it to gravity feed into the system. The condensate passes through a coarse filter (which removes small solids that could clog the carbon filters and oil/water separator) and is then pumped to an oil/water separator, which separates fuel from water. The fuel, which drains into a 55-gallon drum, is collected as reclaimable fuel. The condensate passes

through two hydrocarbon encapsulation filters in series to remove benzene before being discharged to the sanitary sewer. The water filtration system flow rate (5 GPM) ensures maximum efficiency of the oil/water separator and carbon filters.

Ellsworth AFB is currently working with the DRMO to sell fuel recovered from the filtration system. The largest waste stream on the base has been eliminated through the development of a water filtration system. A waste stream that once cost Ellsworth AFB $106,000 for disposal now generates revenue for the base.

Compliance and Pollution Prevention

The 28th AMXS performs maintenance on B-1Bs and other aircraft assigned to Ellsworth AFB. Maintenance activities routinely generate petroleum products that require clean up and proper disposal. The South Dakota EPA mandates that surface water run-off be controlled to prevent petroleum products from contaminating the environment. In an effort to meet these requirements, the 28th AMXS developed and implemented a top-notch process that collects, stores and disposes used oil, hydraulic fluid, PAO coolant oil and waste JP-8 safely, with minimal impact to the environment.

In the course of normal aircraft maintenance and servicing, a substantial amount of used petroleum product is generated. Ellsworth AFB was faced with the problem of disposing of these products and preventing their discharge into the ramp storm water system. With MAJCOM approval and funding, a Used Oil Collection Point (Dock 81) was put in place.

Dock 81 Used Oil Collection Point

The 28th AMXS purchased several pieces of equipment, including a Cyclone Absorbent Mat Spinner, two manual wringers and several containment pallets for storage. Dock 81 was placed under the direct supervision of the Unit Environmental Manager (UEM). The UEM's primary task is to ensure the equipment is maintained, and personnel are adequately trained. Once the collection point was put into operation it immediately paid dividends for maintenance personnel on the flightline. The results of this process ensured that ramp space was cleaned of used petroleum products; absorbent material service life was extended, and a potential pollution source was turned into revenue from recycling.

Household Hazardous Materials Program

In June 1997, Ellsworth AFB established a TIGER Team to evaluate the possibility of recovering household hazardous materials (HHM). This program is designed to recover usable HHM from personnel making a permanent change of station and re-issue it to the base populace. This program prevented unnecessary landfill disposal, and reduced costs for base personnel.

HHM must meet strict criteria before acceptance by the base HAZMART pharmacy for redistribution. There are three main categories of material that qualify for this program: cleaning

HHM Awaiting Redistribution

supplies, automotive supplies, and paints/self-help supplies. Base personnel can obtain recovered products free of charge at the HAZMART Pharmacy. The latest initiative involves the recovery of gas from lawn mowers and other lawn care equipment. The HHMP concept is to reduce or eliminate hazardous waste to be landfilled.

Propane-Air Mix Plant

Ellsworth AFB, situated on the North American high plains, can experience frequent severe winter storm events. When temperatures dip far below zero, and are accompanied by blizzard conditions, the potential for primary power failure necessitates a reliable standby energy system. In the past, the installation relied on fuel oil stockpiled in underground storage tanks (USTs). While dependable for its time, the antiquated fuel oil system had increasingly become a fiscal burden and an environmental hazard. A labor intensive and time-consuming switchover process required workers to physically switch each building on the installation to the secondary system, placing enormous strains upon an already reduced labor pool. The presence of 695 fuel oil USTs, many potentially leaking, posed a continuing environmental threat. Faced with mounting operational and environmental costs, Ellsworth AFB resolved to identify a cost effective and environmentally proactive alternative to the fuel oil system.

Entering into a unique partnering agreement, Ellsworth AFB teamed with Prairielands Energy Marketing, Inc. to construct a Propane-Air Mix Plant. The joint project provided a solution to remedy the fiscal, environmental, and operational problems associated with the aging fuel oil system and created a win-win situation for all parties involved.

Propane is readily available and second only to natural gas as the lowest pollution producing fossil fuel. However, in order to make propane compatible with a preexisting natural gas system, it must first be mixed with air. When air is mixed with propane, the inherent density and heating value of the gas is diluted to levels that correspond to that of methane, the primary component of natural gas. This results in a mixture that burns with characteristics similar to natural gas and is compatible with natural gas fired equipment. Consequently, propane-air can be supplied concurrent to a disruption in the natural gas supply allowing for a seamless switchover and uninterrupted power. Additionally, propane systems provide unparalleled energy security at a markedly lower cost than competing systems.

Ellsworth AFB, a conscientious environmental steward, took the initiative to adopt the usage of a propane based secondary energy system whose benefits include:

- The removal of aged USTs to mitigate present and future environmental hazards.
- Reduced greenhouse gas emissions resultant from cleaner burning fuels.

Fuel Oil UST Pull

Propane-Air Mix Plant

- Reduction in particulate emissions and over all environmental impact.
- Encourage the use of clean burning fuels.

And whose fiscal benefits realized:

- A 35% reduction in energy cost.
- Elimination of operating and labor cost through private ownership.
- Prevention of future environmental liabilities.

Today Ellsworth AFB's successful partnering, planning, and implementation have resulted in the production and continuing operation of a clean and efficient secondary energy system. For more information concerning the Propane-Air Mix Plant, contact Dave Goodsell at DSN 675-2680.

Rag Washing System

The 28th CES Environmental Management Flight installed a unique prototype closed loop rag washing system designed to wash, rinse, and dry 100 rags per load in approximately two hours. The rag washer prototype consists of three systems: 1) a closed-loop wash system; 2) a closed-loop rinse system; and 3) an EQ1 Mart process treatment system, which coagulates dissolved solids. During the cleaning phase, rags first pass through the wash cycle and then through a rinse cycle, leaving the soapy water to be reused several times.

When the soapy water can no longer be reused (due to excess dissolved solids), it enters the EQ1 Mart process treatment system. After treating with coagulants for approximately 2 hours per batch load, the dissolved solids in the water will yield approximately 5-10 pounds of filtered sludge to be disposed as hazardous waste. This system will help avoid potential regulatory liabilities/issues and achieve cost reduction since rags are reused, wash water recycled and volume of hazardous waste reduced.

Closed Loop Rag Washing System

EQ1 Mart

Shop Specific Hazardous Waste Management Plans

The Ellsworth AFB Environmental Flight has developed comprehensive Shop Specific Hazardous Waste Management Plans (SSHWMPs), which will enable the HW Program Manager to maintain positive control of the waste handling and disposal methods employed by the shops through proper waste identification. The SSHWMP categorizes waste streams by type such as, (Hazardous, Universal, Non-RCRA, etc.) and groups them in tables accordingly. Each table identifies accumulation point numbers, waste stream descriptions, sampling information and relevant guide sheets for all waste streams generated by a given shop. Depictions of shop specific processes that generate each waste stream follow each table.

The Environmental Flight also designed a Non-industrial Waste Management Plan (NIWMP) format to provide guidance for activities, including associate units at Ellsworth AFB that generate or manage limited waste in the form of empty containers and/or spent light bulbs. Guide sheets provided in the SSHWMP and the NIWMP list approved procedures for collecting, storing, and disposing of each type of waste. These guide sheets are available to the potential contractors and the public through

the base contracting website @ http://www.ellsworth.af.mil/28bw/mission_support_group/contracting_sq/pages/HazWasteGuideSheets.html. To date approximately 110 SSHWMPs and NIWMPs have been written for shops located on Ellsworth AFB. The shops are required to make the necessary pen and ink changes as needed to keep the plans current throughout the year.

Synthetic Minor Source Air Quality Permitting

Ellsworth AFB currently operates under a Title V Air Quality Operating Permit as a major source for emitting nitrogen oxides (NOx). However, there have been recent changes in the base air quality emissions. For example, the medical waste incinerator was shut down and disconnected, making Ellsworth a true minor source of Hazardous Air Pollutants. Rather than renew the current Title V Air Quality Operating Permit, the base has applied for a Synthetic Minor Source Air Quality permit, which will reduce liability and eliminate the cost of emission fees.

But, in order to obtain a minor source permit the base was required to impose limits, ensuring the potential to emit nitrogen oxides is below 100 tons per-year, which would meet synthetic minor permitting requirements. As was expected, there was a marked decrease in emissions after limits were imposed. The highest emission of NOx for any 12-month period since the decommissioning of the incinerator was 22.1 tons per-year. The Synthetic Minor Source Air Quality Operating Permit Application is currently under review.

Environmental Restoration

Badlands Bombing Range (BBR)

The former BBR (located within the Pine Ridge Indian Reservation) was created during World War II as a bombing and aerial gunnery range. Various sections of this 341,725-acre range were used for bombing exercises and air to ground operations from 1942 to 1948. Portions of this land have been returned to the Oglala Sioux Tribe (OST) in a step-wise fashion since 1960 and to the National Park Service; however, a 2,400-acre parcel is still retained by the Air Force.

This "Retained Area" is known to contain unexploded ordnance (UXO) from previous training activity, particularly artillery training exercises by the South Dakota National Guard. Recently, the Air Force Center for Environmental Excellence (AFCEE) and the Naval Research Laboratory (NRL) have developed a partnership in testing new technology: the remote detection of buried UXO. The NRL has surveyed most of the Retained Area with its Multi-sensor Towed Array Detection System (MTADS), an airborne and ground system, which identifies the location, type and orientation of buried UXO. Surface sweeps of the area for UXO have been completed by the Air Force, and the information generated by MTADS will be used in future UXO removal efforts at the site.

The Retained Area has also been investigated by the Ellsworth AFB Environmental Restoration Program (ERP) to determine the presence of contamination. Soil and groundwater samples have been analyzed for metals, explosives, and volatile organic compounds, and there have been no significant contaminants found. Sampling of selected groundwater wells and analyses for perchlorates was performed in May 2003.

NRL Airborne System at Badlands Bombing Range

Currently, the Air Force is researching archives pertaining to previous uses and past ownership of the Retained Area in anticipation of the eventual

return of the property to its original owners. Public outreach activities are also underway to provide information to the Oglala Sioux Tribe and area residents concerning the status of the Retained Area. A final surface sweep of the Retained Area will be performed in late 2003 to locate and remove scrap materials from the area (particularly metals).

Living Snow Fence Installation

Ellsworth AFB continues to develop innovative and practical environmentally friendly solutions. For example, Ellsworth AFB has worked collaboratively with the Natural Resources Conservation Service (NRCS) to devise a dual-purpose solution to address groundwater contamination and dilapidated snow fence issues in 2003. Twelve hundred trees (including Dogwood, Cottonwood, and Spruce) purchased from NRCS were planted in accordance with their guidelines to form a tree line.

The trees were planted north of the ground water contamination (which consists of dissolved trichloroethylene (TCE) and affects the north and east portions of the Base). As part of the remediation process, extraction wells were installed at various locations on the Base to pump and treat the contaminated ground water. After being treated by an Environmental Restoration Program (ERP) groundwater treatment facility, the water will be used to irrigate the trees via an automated irrigation system, rather than discharged into the Base sanitary sewer system, where the treated ground water would be needlessly treated again.

Once the trees mature, the tree line will function as a "living snow fence", controlling drifting snow and reducing snow accumulation on roads and in residential areas. Not only will the trees function as a snow fence through productive use of treated groundwater, but by the same token, eliminate dilapidated Wyoming snow fences as well as costly snow fence maintenance and provide excellent winter shelter and habitat for wildlife, not to mention "spruce up" the existing idyllic rolling black hills.

Natural and Cultural Resources

Prairie Dog Trapping and Relocation

Ellsworth AFB has also developed a partnership agreement with the Turner Endangered Species Fund (TESF) to trap and relocate black-tailed prairie dogs from Ellsworth AFB to Ted Turner's Bad River Ranch in southern South Dakota to reestablish and/or increase new colonies of this indigenous species to the area. Black-tailed prairie dogs are a "Candidate Species" for listing as a Threatened Species under the Endangered Species Act.

Under AF policies and regulations, all candidate species, whenever practical, are treated as if already listed. Approximately 300 prairie dogs were trapped and relocated in 2001 and 2002 with hope of establishing new colonies. As a result of this program, Ellsworth AFB has reduced the need for

Future Living Snow Fence

Prairie Dog Traps

lethal control and helped ensure the continued existence of an important and treasured Great Plains species.

BBR Prairie Dog Management and Black-footed Ferret Survey

Ellsworth AFB has worked expeditiously with the USDA Forest Service in developing an interagency agreement to manage a prairie dog study on the inactive BBR. This study will include a comprehensive survey of the black-footed ferret, a federally listed endangered species, reintroduced and preexisting in the BBR vicinity. If found, ferrets will be captured and relocated to new sites, ensuring the continued success of this nationally renowned reintroduction program as well as a bright future for the species. Excess prairie dogs will be trapped and used to support ferret populations. Some prairie dogs will be used in the "food for ferrets" research program (which conditions young, captive bred ferrets to catch and kill their prey) while others will be used to establish new and/or expand existing prairie dog colonies for future ferret introduction, assuring continued growth of wild ferret populations.

Heritage Lake Habitat Improvement

Fuel spills released into storm drains have the potential to contaminate both on and off-base watersheds. Ellsworth AFB, as part of its stormwater requirements, ensures that the potential for storm water contamination is minimized.

In order to prevent uncontrolled spills, such as flightline fuel spills that could potentially flow into the storm drain, Ellsworth AFB has created environmental synergy by developing Heritage Lake (one of three man-made Base lakes), which serves as an emergency fuel spill containment pond as well as a recreational fishing area for base residents. A concrete spill containment structure (designed and built at each of the three industrial area storm water outfalls) captures and recovers potential fuel spills prior to release off base.

Over the years Heritage Lake had become silted and could no longer support a viable fishery. As a result, the lake was drained and dredged, vastly improving the habitat. Approximately 10,000 cubic yards of silt were removed, increasing the depth and recontouring the shoreline as well as the lake bottom. After dramatically improving the habitat for fish and other aquatic species, the South Dakota Department of Game, Fish & Parks (Cleghorn Springs Trout Hatchery) restocked the lake with approximately 950 rainbow and brown trout. Shortly thereafter, exciting new fishing opportunities resurfaced for the base populous as was reflected by the 240% increase in base fishing license sales. Once again Ellsworth AFB sets the precedent when it comes to maximizing natural resources and cultivating a good working relationship with federal and state agencies as well as the Base community.

Heritage Lake

Stocking Heritage Lake

Environmental Excellence: Commitment to the Future

Ellsworth AFB's environmental success is a result of extraordinary cooperation and dedication between military, contractor, community and regulatory agencies. Ellsworth AFB's commitment to environmental restoration, pollution prevention, preserving natural and cultural resources, and innovative use of technology is a direct reflection of their programs. By maintaining this commitment, the 28th Bomb Wing will continue to successfully integrate environmental excellence in the future, while serving as the backbone of global engagement for the 21st century.

Pollution Prevention Success Stories - Ellsworth AFB, October 2003

Success stories are a product of PROACT, a service of the Environmental Quality Directorate, Headquarters Air Force Center for Environmental Excellence (HQ AFCEE/EQ), Brooks-City Base, Texas. Any comments or suggestions are welcomed and should be directed to PROACT at DSN 240-4240, (800) 233-4356, or pro-act@brooks.af.mil.

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